Sistemul de alimentare cu energie electrica

Curs 4

1

Cuprins

•Cerinte asupra SAEE
•Sarcina electrica a autoveh.
•SAEE generalitati
•Alternatorul auto
•Alternatoare cu excitatie electromagnetica – constructie
•Redresarea curentului alternativ

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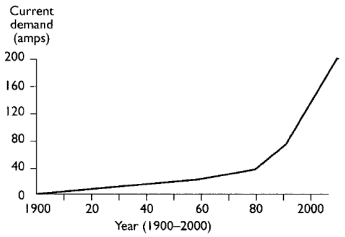
Cerinte asupra SAEE

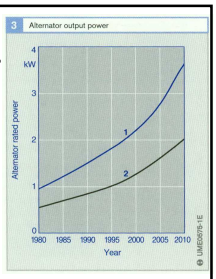
Sa asigure:

- necesarul de energie electrica pentru consumatorii auto
- necesarul de energie electrica pentru incarcarea bateriei
- debiteze energie electrica la turatia de ralanti
- tensiune constanta in toate conditiile
- raport putere/masa, putere/volum eficient
- fiabil, silentios, rezistenta la contaminare
- intretinere redusa
- indicarea functionarii corecte (sau incorecte)

3

Sarcina electrica a autoveh.





G Whiz
Ford (Motorcraft) Alternators Generations by Mustang Years

Gen.	Model Years	Amps.
1G	65-85	40-55
2G	86-93	65-75
3G	94-95 96-98 4.6L 2V	130
4G	96-02 4.6L 4V	130
6G	99-04 4.6L 2V 02-04 4.6L 4V	105

Source: PA-Performance

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Sarcina electrica a autoveh.

Sarcina continua	Putere [W]	I la 14V	I la 28V
Ignition	30	2.0	1.0
Fuel injection	70	5.0	2.5
Fuel pump	70	5.0	2.5
Instruments	10	1.0	0.5
Total	180	13.0	6.5

Sarcina prelungita	Putere [W]	I la 14V	I la 28V
Side and tail lights	30	2.0	1.0
Number plate lights	10	1.0	0.5
Headlights main beam	200	15.0	7.0
Headlights dip beam	160	12.0	6.0
Dashboard lights	25	2.0	1.0
Radio/Cassette/CD	15	1.0	0.5
Total (Av. main & dip)	260	19.5	9.5

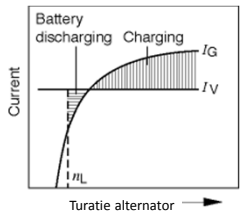
180 + 260 + 170 = 610W (43A la 14V)

Sarcina intermitenta	Putere [W]	I la 14V	I la 28V
Heater	50	3.5	2.0
Indicators	50	3.5	2.0
Brake lights	40	3.0	1.5
Front wipers	80	6.0	3.0
Rear wipers	50	3.5	2.0
Electric windows	150	11.0	5.5
Radiator cooling fan	150	11.0	5.5
Heater blower motor	80	6.0	3.0
Heated rear window	120	9.0	4.5
Interior lights	10	1.0	0.5
Horns	40	3.0	1.5
Rear fog lights	40	3.0	1.5
Reverse lights	40	3.0	1.5
Auxiliary lamps	110	8.0	4.0
Cigarette lighter	100	7.0	3.5
Headlight wash wipe	100	7.0	3.5
Seat movement	150	11.0	5.5
Seat heater	200	14.0	7.0
Sun-roof motor	150	11.0	5.5
Electric mirrors	10	1.0	0.5
Total	1.7 kW	125.5	63.5

Consum mediu: 10% x Total = 0,1x1,7 kW= 170 W

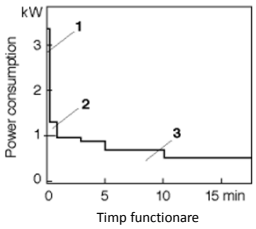
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Caracteristica de debit



n_L – turatia ralanti
I_G – curent generat de alternator
I_V – curent absorbit de sarcina

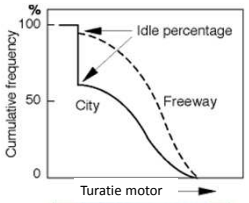
Puterea electrica utilizata ca functie de timpul de conducere (functionare)

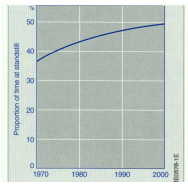


1 incalzitor catalizator
2 turbina secundara de aer
3 incalzitor, ventilator, managementul motorului,

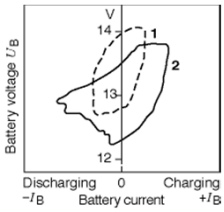
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Frecventa cumulata a turatiei motorului pentru regim urban si extraurban





Caracteristica dinamica a sistemului baterie, alternator, sarcina, turatie, raport transmisie mot./alt.



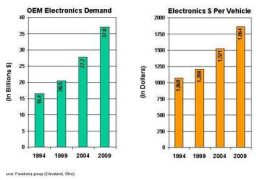
Anvelopa pentru regim urban:
1 – "alternator mare, baterie mica"
2 – "alternator mic, baterie mare"

U_B – tensiunea bateriei
$-I_B$ - curent de descarcare a bateriei
$+I_B$ – curent de incarcare a bateriei

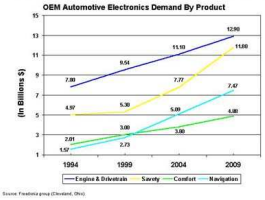
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Sarcina electrica a autoveh.

OEM Automotive Electronics Demand in North America



OEM Automotive Electronics Demand in North America



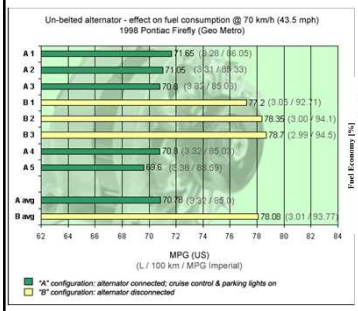
Global Production of Vehicles with 42-Volt Systems

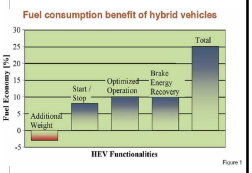
Year	000's
2002	46
2003	155
2004	606
2005	871
2006	2,823
2007	4,497
2008	7,010
2009	10,402
2010	12,891

Source: Standard & Poor's DRI

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Sarcina electrica a autoveh.

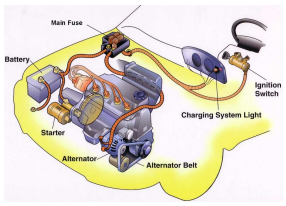


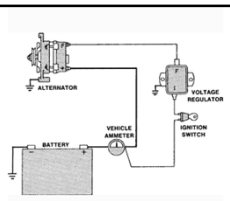


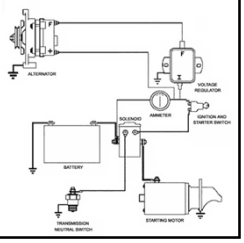
Consum mediu de combustibil: pt. 10kg – 0,1 l/100km; pt. 100W – 0,1 l/100km

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SAEE - generalitati

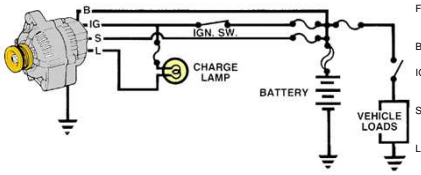






Tensiunea de incarcare: 14,2 ± 0,2V
(incarcare cu tensiune constanta)

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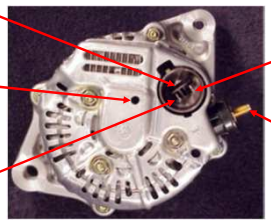


Four wires connect the alternator to the rest of the charging system.
B is the alternator output wire that supplies current to the battery.
IG is the ignition input that turns on the alternator/regulator assembly.
S is used by the regulator to monitor charging voltage at the battery.
L is the wire the regulator uses to ground the charge warning lamp.

"S" Terminal
Senses Battery Voltage

"F" Terminal
Regulator Bypass Full Field Testing

"IG" Terminal
Ignition Switch Signal Turns Regulator ON

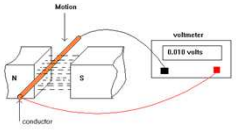


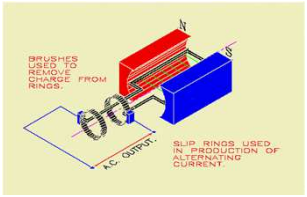
"L" Terminal
Grounds Warning Lamp

"B" Terminal
Alternator Output Terminal to Battery

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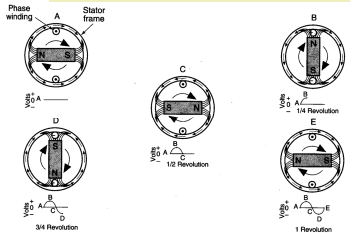
Alternatorul auto



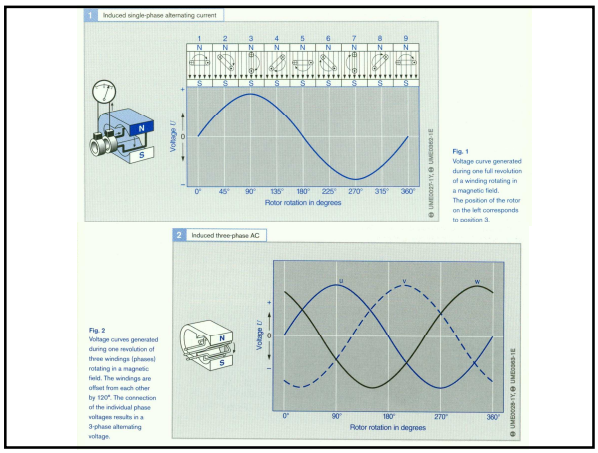


Def.: masina sincrona ce lucreaza in regim de generator avand indusul-stator, inductorul-rotor si redresor incorporat

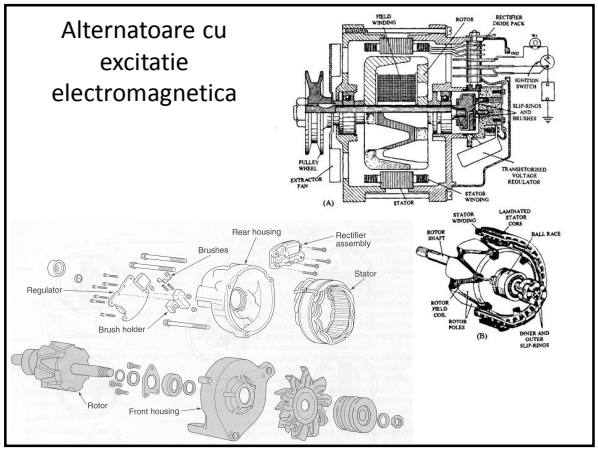
Clasificare:
a) Dupa tipul excitatiei:
   - Cu excitatie electromagnetica
   - Cu magneti permanenti
b) Dupa numarul de faze:
   - Monofazate
   - Polifazate



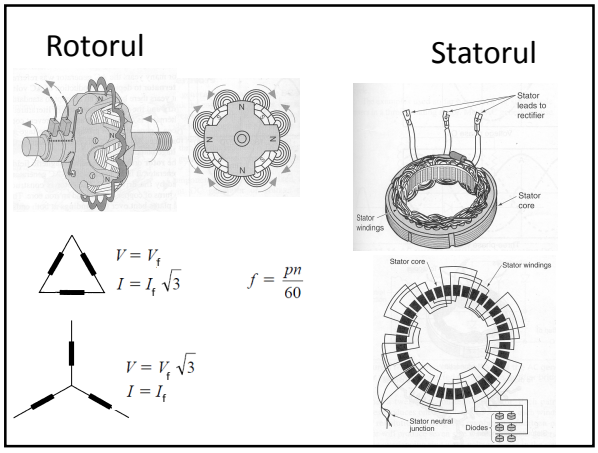
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1 Induced single-phase alternating current
Voltage U
Rotor rotation in degrees
0° 45° 90° 135° 180° 225° 270° 315° 360°
Fig. 1
Voltage curve generated during one full revolution of a winding rotating in a magnetic field. The position of the rotor on the left corresponds to position 3.
2 Induced three-phase AC
U
V
W
Voltage U
Rotor rotation in degrees
0° 90° 180° 270° 360°
Fig. 2
Voltage curves generated during one revolution of three windings (phases) rotating in a magnetic field. The windings are offset from each other by 120°. The connection of the individual phase voltages results in a 3-phase alternating voltage.

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Alternatoare cu excitatie electromagnetica
FIELD WINDING
ROTOR
RECTIFIER DIODE PACK
IGNITION SWITCH
SLIP-RINGS AND BRUSHES
PULLEY WHEEL
EXTRACTOR FAN
TRANSISTORIZED VOLTAGE REGULATOR
STATOR WINDING
STATOR
(A)
Rear housing
Brushes
Rectifier assembly
Stator
Regulator
Brush holder
Rotor
Front housing
STATOR WINDING
LAMINATED STATOR CORE
BALL RACE
ROTOR SHAFT
ROTOR FIELD COIL
ROTOR POLES
INNER AND OUTER SLIP-RINGS
(B)

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Rotorul
Statorul
Stator leads to rectifier
Stator core
Stator windings
Stator core
Stator windings
Stator neutral junction
Diodes
$V = V_f$
$I = I_f \sqrt{3}$
$f = \frac{pn}{60}$
$V = V_f \sqrt{3}$
$I = I_f$

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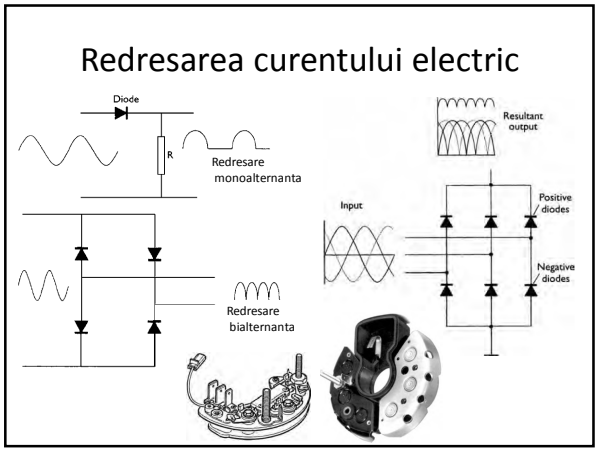


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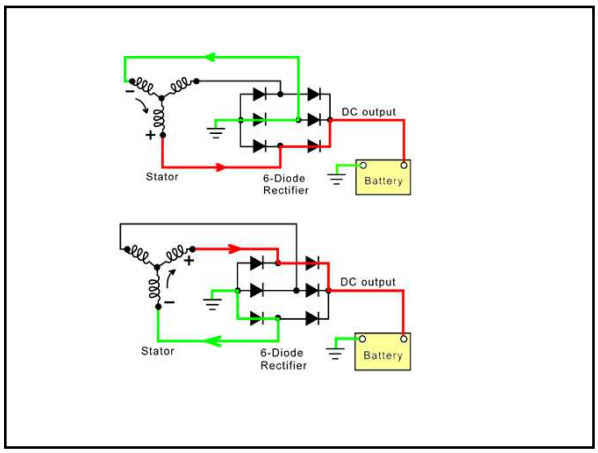


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Redresarea curentului electric

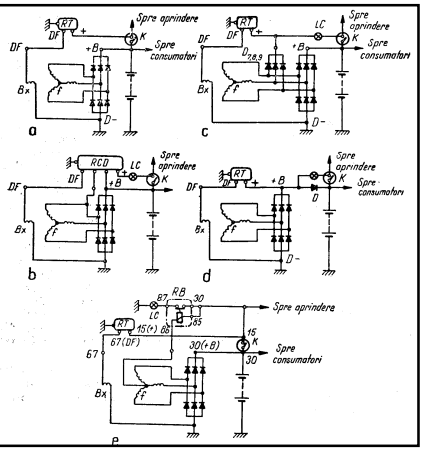


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Scheme de conectare a excitatiei alternatoarelor



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